FG-TRAN-SFP+SR-AOK
10Gbase SFP+ Transceiver

Features

- Compliant to SFP+ Electrical MSA SFF-8431
- Compliant to SFP+ Mechanical MSA SFF-8432
- Multi-rate compliance for Ethernet and Fiber Channel
- Transmission distance up to 300m (OM3 fiber)
- Sub watt power consumption: 0.65W (typ.)
- 0°C to +70°C case operating temperature range
- Laser Class 1 IEC / CDRH compliant
- RoHS 6/6 compliant
- Compliant with product safety standards

Product Description

The FG-TRAN-SFP+SR-AOK is a multipurpose multi-rate optical transceiver module for transmission at 850nm over multimode fiber. Supporting Ethernet and Fiber Channel standards make it ideally suited for 10GB data communication and storage area network applications. Its sub watt power consumption and its excellent EMI performance allow system design with high port density. The small form factor integrates an 850nm vertical cavity surface emitting laser (VCSEL) in an LC package and a PIN receiver. Addon Computer Peripheral's module is lead free, RoHS compliant and is designed and tested in accordance with industry safety standards.

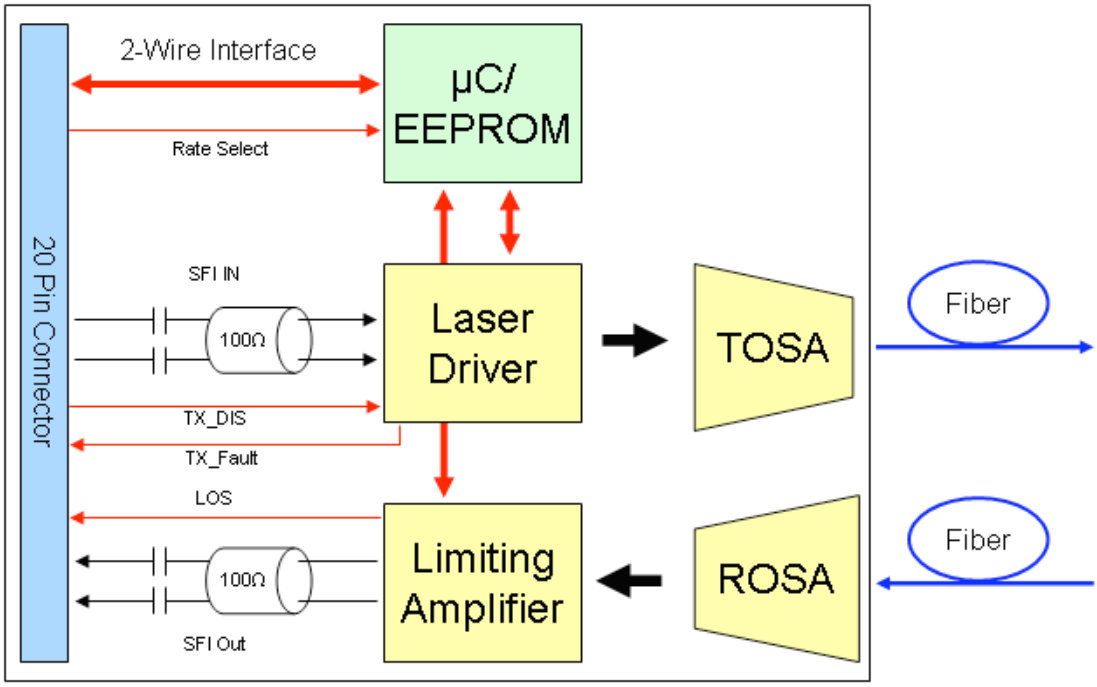
Functional Description

The Transceivers convert information from electrical to optical format, and back again, at different data rates depending upon the chosen standard. The transmit path consists of an AC coupled 100 ohm differentially terminated driver coupled to a highly reliable 850nm VCSEL. The laser output may be disabled by pulling the TX_DISABLE line high. The laser is also disabled if this line is left floating, as it is pulled high inside the transceiver. The SFP+ MSA (Multiple Source Agreement) defines two RATE_SELECT lines, one for the transmitter (pin 9) and one for the receiver (pin 7). Depending upon the transceiver application, the transmitter RATE_SELECT line can switch between1 GBd and 10 GBd.

The receiver path consists of a ROSA (receiver optical sub-assembly) for optical electrical conversion, followed by a limiting amplifier to boost the electrical signal. A LOSS_OF_SIGNAL (LOS) status line is provided to facilitate easy link detection. Depending upon the transceiver application, optimum receiver bandwidth may be configured using the receiver RATE_SELECT pin: for Ethernet applications to switch

between 1 GBd and 10 GBd data rates, and for Fiber Channel applications switch ≤/> 4 GBd data rates.

Not all transceiver versions require RATE_SELECT.



Electrical Characteristics Absolute Maximum Ratings

Rating	Conditions	Symbol	Min	Max	Units
Storage Ambient Temperature Range		Jstg	-40	+85	°C
Powered Case Temperature Range		Jc	0	+75	°C
Operating Relative Humidity	Non condensing	RH	0	95	%
Supply Voltage Range @ 3.3V		VCC3	-0.5	3.6	V
Open Drain VCC Level		VOD		4.0	V
Static Discharge Voltage Speed Pins on High	HBM human body model per JEDEC JESD22-A114-B			1	kV
Static Discharge Voltage excluding High Speed Pins	HBM human body model			2	kV
Static Discharge Voltage Module on SFP+	EN61000-4-2 Criterion B: Air Discharge Direct Contact discharge			15 8	kV

Any stress beyond the maximum ratings may result in permanent damage to the device. Specifications are guaranteed only under recommended operating conditions.

Recommended Operating Conditions

Parameter	Conditions	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	altitude of < 3km	JCase	0		+70	°C
Power Supply Voltage@3.3V		Vcc3	3.135	3.30	3.465	V
DC Common Mode Voltage		Vcm	0		3.6	V

Low Speed Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Supply Current Transmitter	@ VCCTX	IVCCTX			120	mA
Supply Current Receiver	@ VCCRX	IVCCRX			125	mA
Power Consumption				0.65	1	W
TX_Fault, RX_LOS	Host Vcc Range 2V – 3.47V	VOL	0		0.4	V
		VOH	Host_ Vcc – 0.5		Host_ Vcc +0.3	
TX_Dis, RS0, RS1	Low Voltage TTL	VIL	-0.3		0.8	
		VIH	2.0		VccT +0.3	
SCL, SDA	Host Vcc Range	VIL	-0.3		VccT*0.3	
	3.14V – 3.47V	VIH	VccT*0.7		VccT +0.5	
		VOL	0.0		0.4	
		VOH	Host_ Vcc – 0.5		Host_ Vcc +0.3	

Parameter	Conditions		Symbol	Min	Typ	Max	Units
Supported Data Rate			VID	1	10.3125	11.3	Gbd
Reference Differential Input Impedance			Zd		100		Ω
Input AC Common Mode Input Voltage				0		25	mV (RMS)
Differential Input Voltage Swing			VID	150		900	mV
Differential Input S-parameter	0.01 –	3.9GHz	SDD11			-10	dB
	3.9 –	11.1GHz		1)		1)	dB
Differential to Common Mode Conversion 2)	0.01 –	11.1Ghz	SCD11			-10	dB
Total Jitter			TJ			0.28	UI(p-p)
Data Dependant Jitter			DDJ			0.1	UI(p-p)
Uncorrelated Jitter			UJ			0.023	RMS
Eye Mask	See SFP+ MSA		X1			0.14	UI
			X2			0.35	UI

SFI Module Receiver Output Characteristics

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Supported Data Rate			1	10.3125	11.3	Gbd
Reference Differential Output Impedance		Zd		100		Ω
Termination Mismatch		Δ Zd			5	%
Output AC Common Mode Output Voltage					15	mV (RMS)
Differential Output Amplitude	RLoad=100Ohm , Differential	VOSPP	350	650	800	mV
Output Rise and Fall time	20% to 80%	tRH, tFH	24		35	ps
Differential Input S-parameter	0.01 – 3.9GHz	SDD22			-10	dB
	3.9 – 11.1GHz				1)	dB
Common Mode Output Return Loss2)	0.01 – 6.5Ghz	SCC22			-7	dB
	6.5 – 11.1Ghz				-3	dB

1) Return Loss given by equation Sxx22(dB) = -8+13.33 Log10(f/5.5), with f in GHz;
2) Common mode reference impedance is 25Ω. Common mode return loss helps absorb reflection and noise improving EMI.

Optical Characteristics
General Parameters

Parameter	Conditions	Bandwidth Min Modal (MHz*km)	Symbol	Min	Typical 1GBd	Typical 10GBd	Units
Operating Range	62.5 µm MMF 50 µm MMF 62.5 µm MMF 50 µm MMF 50 µm MMF	160 400 200 500 2000	lOP	2 2 0.5 0.5 0.5	220 500 275 550 X	26 66 33 82 300	m

Optical Transmitter

Parameter Optical Transmitter	Conditions	Symbol	Min	Typ	Max	Units
Nominal Wavelength		λTPΠ	840	850	860	nm
Spectral Width	Fiber Channel version	Δλ			0.65	
	Ethernet version				0.45	
Average Launch Power		Pavg	-7.3		-1	dBm
Average Launch Power	Fiber Channel version	POMA	-5.2			
	Ethernet version		-4.3			
Extinction Ratio		ER	3.5			dB
	Ethernet 1.25GBd		tbd			
Relative Intensity Noise		RIN			-128	dB/Hz

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Optical Receiver

Parameter	Conditions	Symbol	Min	Typ	Max	Units
Maximum Input Power		PMAX			-1	dBm
Center Wavelength		λX	840	850	860	nm
Receiver Sensitivity Ethernet	Pavg, PRBS 2^{31}-1, BER < 1*10-12@ 1.25GBd *)	PIN	tbd			dBm
	OMA, PRBS 2^{31}-1, BER < 1*10-12@10.3125GBd		-11.1			
Receiver Sensitivity Fiber Channel	OMA, PRBS 2^{31}-1, BER < 1*10-12@2GBd		-13.0			
	OMA, PRBS 2^{31}-1, BER < 1*10-12@4GBd	PIN	-12.0			dBm
	OMA, PRBS 2^{31}-1, BER < 1*10-12@8GBd		-11.2			
	OMA, PRBS 2^{31}-1, BER < 1*10-12@10GBd		-11.1			
Stressed Receiver Sensitivity Ethernet	OMA, PRBS 2^{31}-1, BER < 1*10-12@1.25GBd	PIN	tbd			dBm
	Pavg, PRBS 231-1, BER < 1*10-12@ 10.3125GBd		-7.5			
Stressed Receiver Sensitivity Fiber Channel (OM3 fibers)	OMA, PRBS 2^{31}-1, BER < 1*10-12@2GBd		-10.8			
	OMA, PRBS 2^{31}-1, BER < 1*10-12@4GBd	PIN	-9.0			dBm
	OMA, PRBS 2^{31}-1, BER < 1*10-12@8GBd		-8.3			
	OMA, PRBS 2^{31}-1, BER < 1*10-12@10.3125GBd		-17.5			
Loss of Signal		Pav_as	-30			dBm
		POMA_deas			-12	
	Ethernet:1.25GBd *)	Pav_deas			-17	

Digital Optical Monitoring

Transceivers offer the ability to monitor important module parameter during operation. The five parameters listed below are continuously monitored for getting information about the current module status. All data is calibrated internally; there is no need for external post processing.

Temperature

Internally measured temperature data is represented as two's complement of a signed 16-bit value in increments of 1/256 °C over a range of -40 to +100°C. Accuracy is better than +/-3%.

Supply Voltage (VCC)

Internally measured supply voltage. Represented as a 16-bit unsigned integer with the voltage defined as the full 16 bit value (0 – 65535) with LSB equal to 100 µVolt, which yields to a total range of 0 to +6.55 Volts. Accuracy is better than +/-3%.

Laser Bias Current

VCSEL bias current. Represented as a 16 bit unsigned integer with the current defined as the full 16-bit value (0 – 65535) with LSB equal to 2 µA, valid range is 0 to 20 mA. Accuracy is better than +/-10%.

Optical Transmitter Power

TX output power measurement is based on internal monitor diode feedback. Represented as a 16-bit unsigned integer with the power defined as the full 16 bit value (0–65535) with LSB equal to 0.1µW. Accuracy is better than +/-3dB over a range of Pavmin to Pavmax.

Receiver Optical Power

RX input power measurement is based on photodiode diode current. Represented as a 16-bit unsigned integer with the power defined as the full 16 bit value (0 – 65535) with LSB equal to 0.1 µW. Accuracy is better than +/-3dB over a range of -12dBm to -1dBm. Note: The specified characteristics are met within the recommended range of operating conditions regarding temperature and voltage.

Regulatory Compliance

Module Safety

Addon Computer SFP+ modules are designed to meet international requirements and standards in terms of product safety. Tests were performed according to IEC 60950-1:2001 (CB scheme).The module is RoHS compliant according to the European Parliament requirements on the restriction of the use of hazardous substances in electrical and electronic equipment (RoHS). The modules optical output power meet Class 1 requirements for laser safety.

Requirements	Standard	Status
Module Safety	IEC 60950-1:2001 EN 60950-1:2001	TUV Report / Certificate available CB Report / Certificate available
RoHS	RoHS Directive 2002/95/EC	RoHS 6/6 compliant Certificate of
Compliance	Amendment 4054 (2005/747/EC)	compliance available
Laser Eye	CDRH 21 CFR 1040.10 and	Laser Class 1 according to FDA
Safety	1040.11 IEC 60825-1 Rev2 2007	Laser Class 1 according to IEC Rev2

ESD & Electromagnetic compatibility

Addon Computer SFP+ modules are designed to withstand high ESD voltages. Its excellent performances in terms of EMI allow system designers to integrate the module in high density applications.

Requirements	Standard	Status
Electro Static Discharge to the Electrical Pins (ESD)	EIA/JESD22-A114-B MIL-STD 883C Method 3015.7	Exceeds requirements Class 1B (>1000V)
		Exceeds requirements
Immunity to ESD	IEN 61000-4-2	Discharges ranging from 2kV to
(housing, receptacle)	IEC61000-4-2	25kV without damages to the
		transceiver
Electromagnetic	FCC Part 15, Class B EN	Exceeds requirements Class B
Emission (EMI)	55022 Class B CISPR 22	with more than 6dB margin

Contact Information

AddOn Computer, Inc. is a leading supplier of Memory Upgrade, Network Transceivers and Network connectivity products to Channel Partners, Resellers and OEMs, with more than seventeen years of direct industry experience. AddOn Computer (ACP) has been the exclusive supplier to Ingram Micro's "Memory Upgrades" program for the past nine years.

AddOn Computer maximizes profitable opportunities for our partners. Our ability to source product worldwide, ensures that our pricing will always be competitive. Offering turnkey solutions, AddOn Computer has forged a reputation as a solutions provider, delivering high quality, cost effective product in a timely and reliable manner.

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